# Gas Barrier and Anti-Flammability of Thin Nano Brick Wall Coatings

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This presentation will cover two properties of nancomposite thin films we study in the Polymer NanoComposites (PNC) Laboratory (http://nanocomposites.tamu.edu/). Thin films of anionic natural montmorrilonite (MMT) clay and cationic polyethylenimine (PEI) have been produced by alternately exposing PET film to dilute aqueous mixtures containing each ingredient. After 30 polymer-clay layers have been deposited, the resulting transparent film exhibits an oxygen transmission rate (OTR) below 0.005 $cm^3/m^2 \cdot day$ when the pH of PEI solution is 10. When multiplied by its thickness below 200 nm, this equates to permeability below that of SiOx. This low permeability is due to a brick wall nanostructure comprised of completely exfoliated clay bricks in polymeric mortar. This brick wall creates an extremely tortuous path at thicknesses below 200 nm and clay concentration above 80 wt%. With optical transparency greater than 85% and the ability to be microwaved, these thin film composites are good candidates for a microwaveable foil replacement in food packaging or for protection of flexible electronics. Similar clay-based coatings have been deposited onto cotton fabric and open-celled polyurethane foam to impart flame retardant behavior, by increasing char yield and reducing peak heat release rate during burn.

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